

## 9. Predicting Geological Conditions Ahead of a Tunnel Face Using the Drill Logging System

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One of the investigations conducted ahead of the tunnel face during the construction of a mountain tunnel is a drill logging, which predicts the geological conditions in the drilling position based on the oil pressure of the hydraulic drill and the rate of drilling. In ordinary drill logging, measurements are taken at a sampling frequency of approximately 1 Hz. In weak rocks where the rate of drilling becomes high, accurately identifying the hardness is difficult. In order to directly process the pulse signals of oil quantity sensor used for measuring the length of drilling (maximum: 1,000 pulses per second), a drill logging system was developed that enables real-time evaluation of changes in geological conditions ahead of the tunnel face at a sampling frequency of 2 kHz, and has been adopted at numerous tunneling sites. The system uses the energy required for drilling per unit volume of excavated rock to evaluate the geological conditions. It was verified that applying the developed drill logging system enables accurate prediction of the hardness of rocks and the crack distribution in hard rock earth.

**Keywords:** tunnel, energy of drilling, evaluation of geological conditions